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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—III.

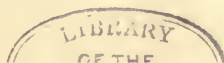
THE PORTSMOUTH SANDY LOAM.

BY

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SOILS OF THE EASTERN UNITED STATES AND THEIR USE—III.

THE PORTSMOUTH SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Portsmouth sandy loam occurs, chiefly in the vicinity of the coast line, from central Delaware south to northern Florida, and thence west along the Gulf of Mexico nearly to the Mississippi River. Soil surveys throughout this portion of the Coastal Plain Province have included 774,052 acres of this type. The type has been encountered in 21 areas located in 9 different States. The Portsmouth sandy loam is found only in the lower lying portions of the Coastal Plain section at elevations varying from slightly above sea level to altitudes not much in excess of 100 feet. As indicated by the soil surveys already made, the area of the type will ultimately be found to cover many hundreds of thousands of acres within this general region. Thus far the type has not been generally developed as a farming soil owing to peculiarities of drainage which will be made evident.

CHARACTERISTICS OF THE SOIL AND SUBSOIL.

The surface soil of the Portsmouth sandy loam to an average depth of 10 or 12 inches is a black, dark-brown, or dark-gray medium sandy loam. This is frequently underlain for a depth of 5 or 6 inches by a gray, sticky sand which grades downward into a mottled yellow and gray or drab sandy clay subsoil. It is not infrequently the case that the surface soil over some portions of each area will be decidedly mucky and practically lacking in the gritty white sand which is characteristic of the greater portion of the type. There will frequently be encountered, usually just below the surface soil, a rusty brown layer of partially cemented subsoil. This "hardpan" is not particularly dense and is usually easily broken up by deep cultivation.

Where fields of the Portsmouth sandy loam have been cultivated for some time, and especially where they have been burned over, the color of the surface soil is liable to be dark gray to light gray, and accumulations of the white quartz sand may frequently be seen. There are rarely any pebbles or iron concretions to be found in the surface soil, although the latter may be encountered sometimes near the contact between the surface soil and the subsoil.

The Portsmouth sandy loam is easily distinguished from the soils of any other series because of the dark-brown to black color of the surface soil and the gray or mottled yellow and gray character of the subsoil. It is also distinguishable from the fact that it is practically always in need of drainage and is thus sharply contrasted with the surrounding upland soils. The soils of the Norfolk series are distinguished by their gray surface soils and yellow subsoils, and those of the Orangeburg series by the gray surface soils and red subsoils. The Portsmouth sandy loam occurs most frequently in association with the soils of the Norfolk series and is readily distinguished from them by its darker color, by its gray subsoil, and by its poor natural drainage.

THE SURFACE FEATURES AND DRAINAGE.

Practically all areas of the Portsmouth sandy loam occur either upon very flat uplands, in slight depressions, or in basinlike hollows, or else they occur around the headwaters and upper reaches of the sluggish streams of the lower lying portion of the Coastal Plain. Wherever ridges occur in the general area of the type these are very likely to be found to belong to some other soil type, usually of the Norfolk series.

As a consequence of the level or depressed position of the Portsmouth sandy loam the natural drainage of the type is always poor, and the greater part of its area is found to be semiswampy or wet. In almost all localities the type supports a growth of hardwood, including the sweet gum, the red maple in more northern localities, and bay bushes, creeping vines, saw-palmetto, and the pitcher plant in the more southern areas.

It is only where the margins of this type have been cleared from their original forest growth, and where artificial drainage has been partially established, that agriculture has occupied any portion of its area. In the more northern locations, where the demand for land is greatest and where the capabilities of this soil have been more generally discovered, numerous extensive areas have been cleared and drained, either by open ditches or by tile underdrainage. These drained lands constitute the most extensive cultivated areas of any portion of the Portsmouth sandy loam. In more southern latitudes, where drainage has been less extensively inaugurated, very little of the type, except in its marginal portions, has been brought under cultivation to any crop.

For the utilization of this soil type, drainage is a fundamental prerequisite. In case the area of the type upon any particular farm constitutes but a small acreage, and in case the natural facilities for drainage are at all adequate, the opening of old water courses, deepening and straightening the channels of the streams, and the cutting

out of rank undergrowth will frequently serve to bring the soil into a condition satisfactory for the production of some farm crops. In general, however, an adequate system of open ditches constituting the main outlets should be established, and the tilled fields should be drained into these open ditches through the establishment of lines of tile underdrains. Such reclamation of the land will entail a considerable cost to the individual farmer who desires to reclaim areas of the Portsmouth sandy loam found upon his farm. The cost of constructing the open ditches and the tile drains under normal conditions will vary from \$15 to \$30 an acre. The cost of clearing the land of the hardwood timber and the vines and undergrowth will not infrequently amount to an additional charge of \$15 to \$20. This high initial cost of bringing the land under cultivation has thus far prevented the utilization of the Portsmouth sandy loam in any regions except where the demand for land has already become pressing. It also accounts for the considerable areas of this and similar soil types which remain undrained along the Atlantic coast from Maryland southward. In due process of time, when the particular crops which can be most successfully grown upon the Portsmouth sandy loam are in greater demand, when the facilities for transporting these crops to market become greater, and when the considerable agricultural value of the soil itself is better understood, it is safe to predict that increasing areas will be cleared, drained, and brought under cultivation.

LIMITATIONS OF YIELD.

In the discussion of crop yields upon the Portsmouth sandy loam, it is essential to recall that these yields have usually been limited more directly by the factors of adequate or inadequate drainage than by any other characteristic of the type. In general, where the Portsmouth sandy loam has been well drained, well cultivated, and limed, the yields of the general farm crops have been found to be satisfactory. The type is considered a good soil for the production of corn from Delaware to South Carolina. The normal yields of this crop upon unlimed soils range from 20 to 30 bushels. Where burned stone lime has been applied to the extent of 1,000 pounds to 3,000 pounds per acre, these yields have been doubled. It has also been found in the practice of the best farmers that the application of commercial fertilizers containing a high percentage of potash has been attended with excellent increases in the yields of the crops. In some localities kainit has been used with considerable success as a source of the potash salts. In the case of cotton many farmers claim that the use of kainit tends to reduce the liability of the cotton to rust and consequently increases the vigor of its growth, thus insuring better yields than any other form of fertilizer which may be

applied. It is usually best to apply the kainit in connection with complete commercial fertilizers, both for cotton and for corn.

Since the original state of the soil is that of a partially drained swamp, it is found very essential to practice deep plowing and thorough tillage of the land, in order that air may be admitted to as great a depth as possible into the soil and subsoil. It is not advisable in such areas as possess the brown layer of "hardpan" to turn up any considerable quantity of this material at one time through deep plowing. In fact, it is generally better to increase the depth of plowing about 1 inch each year until a total depth of 8 or 9 inches is attained. When this practice is accompanied by the liberal application of lime, increased crop yields will almost invariably follow. The principal limitations, then, upon the yields of the staple farm crops are presented by inadequate drainage, the question of the application of lime, and that of increased depth of plowing in preparation for the crop.

LIMITATIONS UPON SPECIAL CROPS.

It is only upon the more northern areas of the Portsmouth sandy loam that the special truck crops have been raised to any extent. This arises largely from the fact that the soil is poorly drained, moist at all seasons of the year, and consequently matures the crops planted upon it at a later season than the same crops are matured upon well-drained sandy upland soils in the same region. Thus the early truck crops of Irish potatoes would normally be raised upon the Norfolk fine sand, or the Norfolk sandy loam, while upon the same farm the proprietor would produce his later crop of potatoes for home use or the general market upon the Portsmouth sandy loam. The same is true of the majority of other crops which may be produced to advantage upon the Portsmouth sandy loam. It is, therefore, only in the more northern areas that the general trucking crops have been produced to any extent upon this type of soil.

For the production of the special truck crops, drainage is again the prime essential. It is also necessary to clear the land very completely of the old stumps and stubs of the previous forestation, in order that the implements of tillage may be freely used in the cultivation of the truck crops. With certain of these crops, particularly cabbage and kale, the liming of the land is advisable. This is also true if such crops as peas and beans are to be raised. The use of lime upon the soil, however, should not precede the planting of Irish potatoes, but should follow the removal of that crop. It is also found desirable in the production of cabbage, kale, spinach, lettuce, onions, and celery, as well as in the production of berries, to use nitrate of soda as a source of the nitrogen to be applied to the crops. Owing to the great solubility of this fertilizing salt the best truck growers fre-

quently find it advisable to split the entire application into several parts, which are applied to the crop at different times during the growing season.

EXTENT OF OCCUPATION.

In Delaware and upon the Eastern Shore of Maryland considerable areas of the Portsmouth sandy loam have been cleared, drained, and placed under cultivation. To a more limited extent the same is true of eastern Virginia and of eastern North Carolina, where the location of the type near to transportation facilities enables the farmers to produce the special crops rather than general farm crops. Southward from Cape Hatteras, however, it is probable that more than 90 per cent of the entire area of the type still remains uncleared and undrained and awaiting a sufficient demand for land to warrant its occupation. In these latter areas only upon the margins of the type where the better-drained upland subsoils descend toward the swamps or stream courses has cultivation been pushed out across the boundary and the Portsmouth sandy loam cultivated. Small areas of a few acres of extent occurring in depressions through other types of soil are also cultivated and produce fair yields of cotton, corn, and oats.

There is certain to be a greater demand for this class of soil as rapidly as its special adaptation to corn and oats among the general crops and to the late trucking crops becomes more thoroughly appreciated.

TILLAGE REQUIREMEN.

Probably after the land has been drained and brought under cultivation the most essential requirement of the Portsmouth sandy loam is deeper plowing and thorough stirring of the surface soil, in order to promote thorough aeration. Unless the free draining off of surplus water is assisted the land is liable to remain cold, wet, and sour, and there is very little circulation of moisture. Stagnant water within the soil type is harmful to crop growth, whereas the same amount of water freely circulating through the surface soil and percolating downward through the subsoil will greatly assist in the production of satisfactory crops.

CROP ADAPTATION.

General farm crops.—The Portsmouth sandy loam is best suited to the production of corn among the general farm crops. Where considerable areas of the type have been cleared in the Middle Atlantic States, yields of 20 to 30 bushels of corn per acre are habitually secured. Small applications of burned lime, amounting to not more than 500 to 800 pounds per acre, give a very satisfactory in-

crease in the yield, but in order to secure an adequate sweetening of this soil burned stone lime should be applied at a rate of not less than 1,000 pounds per acre, while double this amount may frequently be used with satisfactory results. In the progress of soil surveys certain localities have been encountered where the application of even the more moderate amounts of lime has increased the yield of corn to 50 bushels per acre, while portions of the type, upon which sufficient lime and a moderate amount of complete commercial fertilizer had been applied, have been known to yield as high as 80 bushels per acre. When these yields are compared with the yields from unlimed areas of the same soil, or with any areas of other soils in the same localities, it will be seen that the proper preparation of the Portsmouth sandy loam will place it in high rank for the production of corn. In fact, it is only surpassed as a corn soil in the seaboard sections of the Middle Atlantic States by the Portsmouth silt loam and some of the better drained areas of stream bottom land.

The Portsmouth sandy loam is also a good soil for the production of summer oats in the more northern regions, and of winter oats in the more southern localities, provided in the latter case the drainage is adequate to prevent the accumulation of stagnant water in the surface soil or over the surface of the land. As in the case of corn, the application of lime not infrequently doubles the yield of oats. It would be an excellent practice in the use of this soil to prepare the land for corn, to apply the lime before the corn is planted, and after the corn is harvested to follow with a winter crop of oats in the more southern localities or a summer crop in the more northern ones. Double benefit would be received from the liming of the soil, since both the corn and the oats would be assisted in their growth.

The Portsmouth sandy loam is occasionally used for cotton production in the States from North Carolina south. The yields are only fair, ranging from one-third bale to a little more than one-half bale per acre. Unless the drainage of the soil is particularly good the cotton is very liable to rust and the yield is materially reduced. Some of the best farmers overcome this difficulty by the use of 300 to 400 pounds of kainit per acre when the land is planted to cotton. The soil may scarcely be recommended as a cotton soil, but should rather be utilized for the production of the forage crops, corn and oats.

Wheat is produced upon a limited acreage of the Portsmouth sandy loam in Maryland and Delaware. The yields are only fair, averaging 12 to 15 bushels per acre, and on such fields as water accumulates during the winter months the winter wheat is liable to be smothered or killed out with the freezing and heaving of the ground. The crop may scarcely be recommended for general production even in northern areas upon the Portsmouth sandy loam.

Limited areas of the Portsmouth sandy loam are planted to rice upon some plantations in South Carolina and Georgia. The crop is produced without irrigation and for local consumption. Under present conditions of rice production it is not probable that any extensive area of the Portsmouth sandy loam would repay the requisite clearing, drainage, and embankment for the production of rice under irrigation in the South Atlantic States. The initial cost of the preparation of the land would be so high that the interest charge upon the investment would constitute a high proportion of the cost of production of the rice. Locally, however, areas of the type may be so used to some advantage.

Truck crops.—The Portsmouth sandy loam in Maryland and Delaware is not infrequently planted to tomatoes, either for sale as a truck crop or for sale to the canning factories. The yields are moderate, amounting to from 5 to 8 tons per acre. These yields are easily exceeded by many of the better-drained upland soils.

Irish potatoes are produced to a limited extent and then only to constitute a medium or late truck crop, or a crop for home use. The yields are fair, ranging from 100 to 150 bushels per acre. South of the Chesapeake Bay region very few potatoes are raised upon this soil. Sweet potatoes are of secondary importance upon the Portsmouth sandy loam in all locations.

To a limited extent the Portsmouth sandy loam from Delaware to South Carolina has been used for the growing of three truck crops, which are eminently suited for production upon the type. These are cabbage, kale, and spinach. Where adequate drainage is installed to reduce the water level to a depth of 18 inches or greater, and where transportation facilities are afforded for the easy marketing of the crop, all three of these crops constitute excellent medium to late truck crops. The cabbage or the kale may be grown as a late summer crop for shipment to northern markets, and may be followed by spinach, which can be marketed during the fall and practically all winter. In order to complete the series of truck crops, it is also possible to produce radishes and spring onions upon the same acreage, and a complete succession of trucking crops may thus be obtained. For the production of cabbage and kale the application of lime at the rate of 2,000 pounds of burned stone lime per acre is advisable. The commercial fertilizers which derive their nitrogen from nitrate of soda are also advisable in the production of these crops. Some of the best growers also apply additional small amounts of nitrate of soda during the growing season. The area of the Portsmouth sandy loam planted to these crops might well be extended as the market demands increase. However, only such areas as have been adequately drained and are well located with reference to means of transportation should be occupied for any of the truck crops.

The more mucky phases of the Portsmouth sandy loam are also well suited to the production of celery, onions, and lettuce, although the acreage devoted to these crops is in the main limited. Again, drainage is essential, but in the case of these crops liming is not nearly so requisite as with the cabbage and kale.

Among the subordinate trucking crops for the Portsmouth sandy loam may be mentioned garden peas, snap beans, and cantaloupes, although the general production of these crops upon the type is not to be recommended.

Berries.—In southern Delaware, in some portions of the Eastern Shore of Maryland, and in a few localities in eastern Virginia and eastern North Carolina a considerable acreage of the Portsmouth sandy loam has been occupied for the production of strawberries. In the more northern localities the Portsmouth sandy loam is the chosen soil for growing this fruit. The land is cleared, drained, and usually thrown up into low beds or ridges with shallow but pronounced trenches between them. Generally the matted-row system of planting is followed, and the strawberries are set out in parallel rows upon the shoulders of the ridges. Tillage operations are then conducted between these double rows and the growth of the vines is restricted as far as possible to the ridges. In general the late varieties of strawberries are planted, the profit lying in the large yields and excellent quality of the berries, rather than in early maturity. The moist soil tends toward the growth of large berries, which are juicy and usually well colored. The large proportion of organic matter in the surface soil protects the berries from being covered with sand when beating rains occur just before the picking season. This difficulty has been encountered upon the more sandy and earlier upland soils, and in many cases has led to the selection of the Portsmouth sandy loam in preference to the other types. When the beds upon the ridges have attained their maximum yield and have begun to decline, new ridges are formed between the old rows and the vines transplanted from the old beds, and in this way the same acreage is frequently maintained in strawberries throughout a considerable number of years. Adequate drainage, heavy fertilization, and careful tillage are required to secure the maximum returns from the strawberries. The crop, however, is one of the most important special crops which may be produced upon the Portsmouth sandy loam.

Within recent years the Portsmouth sandy loam has been planted to some extent to dewberries in the same general localities where strawberry culture has been developed. The crop has proven successful and additional acreages will undoubtedly be developed upon the type.

SUMMARY.

The Portsmouth sandy loam is an extensive soil type lying at low elevations from near tide level to approximately 100 feet in the tide-water portion of the Coastal Plain from Maryland to Mississippi.

It is marked by dark-gray, brown, or black mucky surface soils, and by gray or mottled yellow and gray subsoils. Its surface is flat or depressed and the natural drainage conditions are poor.

It constitutes an excellent soil for the production of corn and oats when drainage has once been established and particularly when the soil has been limed.

It is more valuable in the more northern locations for the production of the medium and late truck crops, especially cabbage, kale, spinach, celery, onions, lettuce, late strawberries, and dewberries, than it is for general farming purposes.

It is only in the more northern areas and near market facilities that any large proportion of the type has been cleared and cultivated.

The cost of clearing and draining any extensive areas of the Portsmouth sandy loam is so great that until land prices where it occurs have materially increased it will remain as an unappropriated part of the soil resources of the region.

APPENDIX.

The following table shows the extent of the Portsmouth sandy loam in the areas surveyed to this time. In the first column is stated the particular soil survey in which the soil was encountered; in the second column, its extent in acres; and in the third column, the particular volume of the Field Operations of the Bureau of Soils in which the report upon the area may be found. Those desiring a detailed description of the soil and of the general conditions which surround it in any particular area may consult these volumes in almost any public library.

Areas of Portsmouth sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.
	<i>Acres.</i>	
Alabama: Henry County	704	1908
Delaware: Dover area	50,304	1903
Florida: Gainesville area	40,384	1904
Georgia:		
Grady County	1,088	1908
Thomas County	12,928	1908
Maryland:		
Easton area	27,840	1907
Worcester County	9,856	1903
Mississippi: Scranton area	6,272	1909
North Carolina:		
Craven area	41,408	1903
Edgecombe County	5,056	1907
Pitt County	22,272	1909
Raleigh to Newbern area ¹	37,860	1900
Robeson County	62,080	1908
Scotland County	9,152	1909
South Carolina:		
Conway area	5,248	1909
Darlington area ²	133,696	1902
Lee County	62,464	1907
Orangeburg area	131,904	1904
Sumter County	56,000	1907
Virginia:		
Norfolk area	30,016	1903
Yorktown area	20,032	1905

¹ Mapped as Goldsboro compact sandy loam.

² Mapped in part as Goldsboro compact sandy loam, and in part as Selma heavy silt loam.

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